



Soyuz 27 Return Samples: Air Quality aboard the International Space Station-Revised

The toxicological assessment of 6 GSCs from the ISS is shown in Table 1. The average recoveries of the 3 surrogate standards from the grab sample containers were as follows: ^{13}C -acetone, 115%; fluorobenzene, 108%; and chlorobenzene, 93%. Average recovery from formaldehyde control badges was 91%.

Table 1. Analytical Summary of ISS Results

Module/Sample	Approx. Date of Sample	NMVOCs ^a (mg/m ³)	Freon 218 (mg/m ³)	T Value ^b (units)	Alcohols (mg/m ³)	Formaldehyde ($\mu\text{g}/\text{m}^3$)
Lab	8/25/11	--	--	--	--	22
SM	8/25/11	--	--	--	--	16
SM	10/10/11	4.8	37	0.34	3.2	18
Lab	10/10/11	5.4	48	0.37	3.6	29
JPM	10/10/11	4.9	44	0.33	3.4	Not available
SM	11/08/11	5.1	23	0.33	3.2	25
Lab	11/08/11	5.4	40	0.37	3.3	34
Columbus	11/08/11	6.1	41	0.38	3.6	Not available
Guideline		<25	none	<1.0	<5	<120

^a Non-methane volatile organic hydrocarbons, excluding Freon 218

^b Based on 180-d SMACs and calculated excluding CO₂ and formaldehyde.

General Observations about ISS Air Quality:

This is a very limited set of samples on which to perform an air quality assessment. However, based on these samples, we have no reason to believe that nominal ISS air is unsafe to breathe. We must continue to be vigilant when dealing with nominal atmospheres in ISS. Beginning with the next set of grab samples from the ISS, the archival results will be supplemented by results from the Air Quality Monitor DTO unit, which provides a weekly look at selected trace pollutants in the ISS atmosphere.

Carbon Dioxide: This anthropogenic compound has drawn much attention recently because of the possibility that it could contribute to the ocular effects of intracranial hypertension experienced because of spaceflight-induced fluid shifts. The average carbon dioxide concentrations associated with the samples above were 1.8 ± 0.1 mmHg (October) and 1.6 ± 0.1 mmHg (November). These values are about 0.1 mmHg above the Columbus ppCO₂ #2 sensor, which runs 0.1 to 0.2 mmHg above the Columbus ppCO₂ #1 sensor. These values are well below the target level, which is below 3.5 mmHg.

John T. James, Ph.D.
Chief Toxicologist

Enclosures

Table 1: Analytical concentrations of compounds found in the Soyuz 27 GSCs

Table 2: T-values of the compounds in table 1